Thesis/
Reports
Willard,
E. E.

GRIZZLY BEAR AND ITS HABITAT

E. Earl Willard & Margaret Herman

Grizzly Bear
and Its Habitat

Grizzly Bear
and Its Habitat

E. Earl Willard
and
Margaret Herman

LIBRARY COPY
ROCKY MT. FOREST & RANGE
EXPERIMENT STATION

Acknowledgements

This project was made possible through a cooperative grant between Region I of the U. S. Forest Service and the Montana Forest and Conservation Experiment Station of the University of Montana Forestry School.

Table of Contents

	Page
Acknowledgements	i
Introduction	1
Historical Perspective	1
Present Distribution and Status	4
Habitat Relationships	7
Grizzly Bear Habitat	8
Habitat Types	10
Food Habits	11
Dens	13
Day Beds	14
Home Range	14
Habitat Model	15
Appendix	17
Bibliography	22
Sources of Information by Subject	28

Introduction

This publication has been developed as an attempt to summarize the existing information on the grizzly bear (Ursus horribilis), with special reference to the western United States. It is particularly directed toward examining the historical distribution, present status, and habitat relationships of the species. Our literature search has resulted in the accumulation of a vast amount of information, much of which is repetitious, some of which is contradictory, and all of which is important to the understanding of the grizzly. Rather than to record each note that we encountered relative to the grizzly, we selected the more important references to include in the literature summary, and have placed all other references in the bibliography.

As our literature review progressed, it became apparent that there remains much to be learned about the grizzly and its habitat. There is a question about which particular elements of habitat are required for grizzly survival, which are only preferred, and which are relatively unimportant. It is hoped that this paper will serve to point out those areas involving grizzly habitat where more research and studies are needed.

Historical Perspective

Lewis and Clark were the first of the early explorers to contribute factual information about the primitive range, habits, habitat and physical characteristics of the grizzly (Burroughs 1961). Tracks of grizzlies were observed at the mouth of the Moreau River in South Dakota and

on the Heart River near Bismarck, North Dakota. Later, numerous tracks were observed at the mouth of the Little Missouri River. A grizzly was also observed as the expedition approached the junction of the Missouri and Yellowstone. The first grizzly to be killed was at the mouth of the Yellowstone River, but numerous others were encountered as the party progressed up the Missouri. Several were seen near the Great Falls of the Missouri. Altogether, twenty-three grizzlies were killed between the mouth of the Yellowstone River and Three Forks, Montana, while several others escaped the hunters. During the return trip, six grizzlies were shot west of the Continental Divide on the Clearwater River in Idaho, and fourteen were killed east of the Continental Divide in the Yellowstone and Missouri Valleys.

Lewis made the following summary statement of the distribution of the grizzly:

> "The brown, white or grizly bear are found in the rocky mountains in the timbered parts of it or Westerly side but rarely; they are most common below the rocky Mountain on the borders of the plains where there are copses of brush and underwood near the water courses. They are by no means as plentiful on this side of the rocky mountains as on the other, nor do I believe that they are found at all in the woody country, which borders this coast as far in the interior as the range of mountains which, pass the Columbia between the Great Falls and rapids of that river." (This summary was written at Fort Clatsop in south-west Washington.)

The diaries of other early explorers, naturalists, and fur traders recorded the presence of the grizzly in the early 19th Century as summarized by Burroughs (1961). Robert Stewart killed a grizzly near

the present site of Driggs, Idaho in 1912. Alexander Henry observed grizzlies in the valley of the Red River and nearby Hair Hills in North Dakota. Maximillian found them to be plentiful in the Missouri River valley above the mouth of the Little Missouri and near the mouth of the Yellowstone River in 1833. Ludlow and Grinnell (1876) reported grizzlies to be still common along the Missouri River in 1875.

The grizzly was associated with the large buffalo herds, which furnished an abundant source of food. With the almost complete extermination of the buffalo and settlement of the valleys and foothills, the grizzly disappeared from its former range and is now found only in high-mountain wilderness areas (Craighead and Craighead 1967).

The grizzly bear arrived late upon the North American scene, crossing the land bridge across the Bering Sea from Asia in the last glacial stage of the Ice Age (Macpherson 1965). It moved south into its historic range within the past 10,000 years after the melting continental ice sheets and glaciers permitted access (Martinka 1974a). The grizzly found a suitable habitat in foothills, brushlands and river valleys, but not the high mountains (Herrero 1970a).

According to Schoonmaker (1968), the grizzly lived in Alaska, the Yukon, Mackenzie, the western half of Keewatin, British Columbia, Alberta, Saskatchewan, and southwestern Manitoba. South of Canada it wandered about on the plains, climbed the snow-capped mountains, and swam in the Pacific Ocean. It lived in Washington, Oregon, California, Idaho, Nevada, Utah, Arizona, Montana, Wyoming, Colorado, New Mexico, Texas, North Dakota, South Dakota, western Nebraska, northwestern Kansas, and along a thin strip of western Minnesota. It was also found in the northern part of Mexico.

The grizzly was once fairly abundant in the area now known as the Selway-Bitterroot Wilderness (Wright 1909). However, there is considerable evidence that a viable population no longer exists there (Craighead et al. 1974).

Grizzlies were historically always rare in Washington (Lauckhart and Layser 1975). They are now gone from Texas, New Mexico, Arizona, Utah, Oregon, Kansas and the Dakotas, and none have been sighted in California since 1934 (Craighead and Craighead 1972).

Glacier National Park had a large population of grizzlies when the early explorers visited the area. From the early 1800's to 1910, Glacier was a very popular place to shoot and trap grizzlies (USDI 1918).

Present Distribution and Status

The grizzly has steadily declined in numbers in the continental United States (with the exception of Alaska) until they now exist in remnant populations in a few national parks, national forests in the Rocky Mountains, and in certain wilderness areas of the West (Craighead and Craighead 1967). In 1964, Cahalane reported that in Canada, grizzlies occurred only in the two western provinces of Alberta and British Columbia, and in the Yukon and Northwest Territories. He estimated that the population at that time was bewteen 11,000 and 18,850 animals. The U. S. Fish and Wildlife Service in 1973 estimated the grizzly population to be 10 in Idaho, 300 in Wyoming, 375-700 in Montana, and 10 in Washington, and questioned whether any grizzlies remained in Colorado.

The U. S. Forest Service (1975) stated that the present population of grizzlies in the contiguous 48 states probably does not exceed 1,000, of which approximately one-half are in Glacier and Yellowstone National Parks.

The grizzly bear was placed on the threatened list on August 1, 1975. At that time, a statement was placed in the Federal Register (1975) which reported the presence of grizzlies in the following areas: 1) the Selway-Bitterroot Ecosystem which includes the Clearwater National Forest, Selway Bitterroot Wilderness Area, Salmon River Breaks Primitive Area; 2) the Bob Marshall Ecosystem which includes the Flathead National Forest, Bob Marshall Wilderness, Mission Mountains Primitive Area, and Glacier National Park; and 3) the Yellowstone Ecosystem which includes Yellowstone National Park, Teton National Park, Shoshone National Forest north of the Wind River, Targhee National Forest east of U. S. Highway 20, Gallatin National Forest south of Highway 90, and the Beartooth Primitive Area.

Craighead et al. (1974) stated that the number of grizzlies inhabiting the contiguous 48 states probably does not exceed 600 to 700, with all of these being found only in the high mountain country and the wilderness areas of our large national parks and forests. They estimated the Yellowstone grizzly population to be 222 animals in 1959, 245 in 1967, and 136 in 1974. Cole (1971,1974) estimated the population of grizzlies in Yellowstone to be about 250 in 1970 with an additional 100 outside the park boundaries, and 200-300 in 1971.

The population of grizzlies in Glacier National Park from 1967-1971 was estimated at between 175 and 230 (Martinka 1974c). A relatively stable population averaging 191 was estimated for 1974 by Martinka (1974a).

Weckwerth (1971) stated that grizzlies in Montana are found in Glacier National Park, Yellowstone National Park, Flathead and Kootenai National Forests, Mission Mountains, Absaroka Mountains, Cabinet Mountains, and the Bob Marshall Wilderness Area. Taylor (1964) found signs of grizzlies in the Mission Mountains. About 50 grizzlies are present on the Kootenai National Forest (Ruediger pers. com. 1975). Roscoe (pers. com. 1975) reported

unconfirmed sightings on the Red Rock Lakes National Wildlife Refuge.

A reconnaisance survey of grizzlies in the Lewis and Clark National Forest by Schallenberger (1974) revealed that the Sun River Ranger District contained the largest amount of grizzly habitat in the forest. Most observations were from Scapegoat Mountain to the vicinity of Prairie Reef. Other observations were made in Elk Creek, Smith Creek, Deep Creek, Badger Creek and the South Fork of Two Medicine River.

A few grizzlies may still occupy the Selway-Bitterroot Wilderness Area. Several unconfirmed and widely-scattered sightings have been reported, with the most recent being in Big Creek in 1974 (Ormiston pers. com. 1975).

Within the Swan Range, grizzlies or evidence of their presence have been noted in Addition Creek, Bunker Creek, Sullivan Creek, Quintonkin Creek, and Wheeler Creek (Hamlin and Frisina 1975).

Numerous reports of grizzlies have been made in the Scapegoat Wilderness Area (Grove pers. com. 1975, Craighead 1976).

Reports of grizzlies in the Yellowstone Ecosystem outside of Yellowstone National Park include sightings in the Gravelly Range (1968 and 1969), Tobacco Root Range (1965, 1966, 1967 and 1973), Ruby Range (1967, 1971 and 1972), Coyote Creek (1974), and the Madison River (1970). These observations were obtained from Cook (pers. com. 1975).

Grizzlies still occur in northern Idaho and eastern Idaho adjacent to Yellowstone National Park, and possibly in the "back country" areas of central Idaho (Mohler 1973).

In 1970, the Washington Fish and Game Department reported that there were about 10 grizzlies in the state, including one family group in the North Cascades National Park and another group in the north-east corner

of the state. Lauckhart and Layser (1975) reported two small populations occur in the North Cascades National Park and the Selkirk Mountains.

Grizzlies in Wyoming, outside of Yellowstone National Park, are present in the Absaroka Wilderness Area, Shoshone National Forest, and the Teton National Forest (Roop 1975).

Habitat Relationships

Several elements have been described as necessary before adequate grizzly habitat can be present in an area. These include a ready food source; an adequate site to construct a den; dense forests, brush or "down-fall" for a day bed; a rather remote area where human conflicts are minimized; and an adequate space to support a viable population. These are probably not the only necessary elements of grizzly habitat. The juxtaposition of plant communities, land forms, food, escape cover, den sites, and day bed sites are certainly important in determining whether adequate grizzly bear habitat exists in an area.

Even though grizzlies are present in Glacier National Park, the Bob Marshall Wilderness Area, Yellowstone National Park and other areas, they are by no means uniformly distributed in any of these. Rather, they are present in isolated areas within each of these general areas, mostly in response to habitat quality and human activities. The U. S. Forest Service (1975) has classified general grizzly bear range or habitat into two categories: potential and occupied. Potential grizzly bear habitat includes those areas that formerly supported populations of grizzlies and presently contain the necessary biological components of grizzly habitat to sustain a viable population. There is presently a lack of adequate information to identify potential habitat. Occupied grizzly bear habitat includes those areas where the bears are known to exist through continuous obser-

vations of their presence over the past 10 years. Within the occupied habitat are located areas of critical grizzly habitat. These contain the elements essential for the survival of a viable population.

Grizzly Bear Habitat

Ideal grizzly habitat in Yellowstone National Park includes large unforested areas with fertile alluvial soil with high numbers of rodents and bulbous plants (Cole 1971a). An estimated 80-85% of the area is timbered, much of which lies within the spruce-fir (Picea-Abies) zone. About 75% of the park is presently covered with lodgepole pine (Pinus contorta) in transition to the spruce-fir climax. Sagebrush and grass dominate the drier sites of deeper, rich soils and are important sites for the grizzly. The alpine and subalpine meadows of sedge-bluegrass (Carex-Poa) are also important. Such open-land types in combination with timbered areas appear to be essential for optimum grizzly habitat (Craighead and Craighead 1972). The open areas are the sites where most of the food is produced, while the timbered sites provide some food (mostly berries and pine nuts) along with den sites and daytime bed sites.

Mealy (1975) described the food relationships of grizzlies in Yellowstone National Park. He found that coniferous forests do not provide a constant source of protein for the bears; rather, they feed mostly in sagebrush-grass openings, fairly open ridges, and in alpine meadows. Erickson (1975) stated that steep, closed-canopy forests are unattractive to grizzlies; as a forest stand becomes larger and denser, it becomes less attractive. Fires in the past have helped maintain large openings, thus improving grizzly habitat (Schallenberger 1974).

Summer and Craighead (1973), working in the Scapegoat Wilderness Area, stated that large mountain parks and grasslands interspersed with timber

and alpine meadows may be necessary for feeding as well as social activities. Alder thickets, lodgepole pine downfalls, and other dense stands of vegetation are preferred bedding sites. They reported that the plant species that are indicators of grizzly habitat include whitebark pine, huckleberries, dogtooth violet, American bistort, spring beauty, lomatium and yampa.

Schallenberger (1974) described grizzly habitat as an interspersion of open grassland and parks associated with dense resting and denning cover and an abundance of vegetation, berries in most years, and pine nuts in some years.

Hamlin and Frisina (1975) reported on grizzly bear habitat in the Sun River area. They found that the bears are found in the spring on the mountain fronts on the east slope and in the river and stream bottoms in the back country. The mountain grassland habitat types are very important at this season. During the summer the bears are found in the alpine types, high elevation burns, and on talus slopes. Most observations in the fall have been in timbered areas at low elevations, especially in lodgepole pine thickets and spruce bottoms. The south-facing avalanche paths are highly productive for thinleaved huckleberry (Vaccinium globulare), serviceberry (Amelanchier alnifolia), and mountain ash (Sorbus scopulina). Certain food plants such as glacier lily (Erythronium grandiflorum), western spring beauty (Clatonia lanceolata), and bistort (Polygonium bistortoides) are common in late summer around persistent snowbanks. They cautioned that there are multiple factors comprising good grizzly habitat, many of which may not be related to vegetation. However, it was concluded that seasonal distribution of grizzlies during many years may be tied to the availability of succulent grasses, sedges and forbs.

Martinka (1972) reported on the areas in Glacier National Park occupied by grizzlies. During the spring they are in the low elevation coniferous forests, grasslands, snowslide areas and stream bottoms. During late summer they are in higher elevation forests, shrub fields and alpine areas. Mundy and Flook (1973) found grizzlies to be distributed during the spring to early summer in the forests and avalanche slopes, and during late summer in the alpine meadows in Glacier National Park, British Columbia.

Habitat Types

Lee and Pfister (1974) developed a classification system for the major forest communities of Montana. The basic unit is the "habitat type". The habitat type is the physical environment that supports or can support a climax plant community type. Thus, a classification of forest habitat types in an area is a classification of existing or potential forest community types, and does not necessarily describe the vegetation presently occupying the site. The Forest Service in Region I is currently mapping the forest habitat types on the national forests. These types furnish valuable information to the forester who is concerned about the potential forest community that can occupy a site. The question arises as to the value of these habitat type surveys in identifying animal habitats, especially that of the grizzly bear.

Hamlin and Frisina (1975) stated that there is only very limited information from their work and past work to correlate grizzly bear use to specific habitat types. Baglien (pers. com. 1975) offered little encouragement in the use of forest habitat types to determine the habitat of grizzlies. He stated that typical daily movement patterns may encompass several diverse types, of which the boundaries are sufficiently proximal as to make any

mapping error quite serious. He further pointed out that habitat types are based upon assumed climaxes, while wildlife are most often dependent upon seral stages.

Schallenberger (1974) recorded grizzly observations in various habitat types. These are summarized in Appendices 1 and 2. In addition, Shaffer (1971) recorded the locations of grizzly bears in various habitats in the Apgar Mountains, Glacier National Park. These are summarized in Appendix 3.

Food Habits

The grizzly bear is omnivorous, with the majority of its food being plant material. A list of known food items has been compiled from the published literature and is summarized in Appendix 4.

Craighead and Craighead (1973) reported on the food habits of grizzlies in Yellowstone. In early spring the bears feed on carcasses of elk and other large herbivores. Their role as a carnivore is first as a scavenger, second as a predator of small prey, and last as a predator of large prey animals. During the summer the bears concentrate in meadows and river bottoms to dig roots and tubers and graze on sedges,clover and grasses. During this time they also eat berries, concentrating on them when they are abundant. They feed on field mice and pocket gophers when they are abundant, and move to timbered ridges to feed on pine nuts when they are available.

In the Scapegoat Wilderness Area, Craighead (1976) stated that the grizzly living space must contain huckleberries (Vaccinium spp.), whitebark pine (Pinus albicaulis)nuts, small rodents and big game. He also stated that the grizzly often dines on the succulent leaves and starchy roots of bigroot spring beauty (Clatonia spp.) or bulbs of Milica spectabilis, a mountain grass.

Grizzlies eat some grass in the summer, but increase their intake of ants, beetles, insects and berries (Cooney 1953). Murie (1957) reported that in the Brooks Range of Alaska, excavated roots constitute the main item in the diet, with green grasses and sedges being the next most important components. They also eat berries in season, and take an occasional moose or caribou calf, young birds, eggs, carrion and ground squirrels. According to Shaffer (1971), grizzlies in Glacier National Park begin eating huckleberries at the time they begin to ripen and continue until September when frosts eliminate the remaining berry crop.

Hamlin and Frisina (1975) reported on grizzlies in the Bob Marshall Wilderness and surrounding areas. They found that much of the bear's diet consists of grasses and sedges which are widely distributed throughout its habitat. Berries, particularly thinleaved huckleberry, are in relatively low abundance on the east slope of the Rocky Mountains. Food plants with rhizomes or bulbs are most common in the high elevation burns, meadows and avalanche paths. These occur in scattered patches and cover a small portion of the grizzly's range.

The food habits of grizzlies in Glacier National Park have been described by Martinka (1972). During the spring they concentrate on ungulates and grasses in the wet meadows. From late spring through early summer the bears eat roots, insects, forbs and grasses. During the period from late summer to early fall they eat mostly berries, while later in the fall they return to eating grasses, roots and ungulates. The Columbian ground squirrel (Citellus columbianus) is a food item in all seasons.

Three food economies of grizzlies in Yellowstone have been identified by Mealey (1975). The first is termed the Valley/Plateau Economy. These particular bears eat grasses and sedges during all months except April when

Artiodactyls are the most important food. During the pre-growing season the bears eat animal material; during the growing season they concentrate on grasses, sedges, forbs and rodents; while mostly grasses and forbs growing on moist sites are consumed during the post-growing season. A second group of bears are in the Mountain Economy. They eat grasses and spring beauty during June, July and August, grasses in September and pine nuts in October. A third group of bears is included in the Lake Economy, eating grasses in June and cutthroat trout (Salmo clarki) in July.

Dens

The grizzly appears to have some rather specific requirements for a den site. In Yellowstone National Park, Craighead and Craighead (1970) found that the den sites were located at 7800-9200 feet elevation, in timbered areas, and all but one on north slopes with the den entrance facing north. Dens on a north slope take advantage of prevailing southwest winds which accumulate snow on northern exposures, thus covering the den entrance and insulating the den against outside cold temperatures. There is also a lesser chance of the snow melting on north exposures during a "chinook". The dens were usually at the base of a large tree, and dug in soil types ranging from soft earth to packed soil to rocky talus. Natural shelters such as matted windfalls and rock caves were not much used.

In another study, Craighead and Craighead (1972) expanded on the den site descriptions. One was constructed among rocks on a 45° talus slope, seven were constructed at the base of trees, and three were at the base of stumps or with the entrance beneath horizontal logs. Active and inactive den sites were in the following vegetation types:

Lodgepole pine	7
Lodgepole pine- Spruce/fir	3

Spruce/fir	4
Spruce/fir-Whitebark pine	1
Whitebark pine	1
Douglas fir	1

Murie (1961) found two den sites in Alaska on steep slopes. Grizzly dens in the Scapegoat Wilderness Area were found at 7000 to 9000 feet elevations (Sumner and Craighead 1973). Russell (1967) reported that grizzlies dig their dens on high north-east or east slopes where snow will drift over the entrance in winter.

Shaffer (1971) described dens found in Glacier National Park. One was at 6100 feet elevation, in a Subalpine fir/ Menziesia habitat type, on a north-facing ridge, on a 65% slope, and at the base of a subalpine fir. The next year a new den was found 150 feet from the old one. Another den was located on a north-facing ridgetop.

Day Beds

Day beds in Yellowstone consist of shallow excavations scooped from the earth in dense timber or dense windfalls, often in a thick stand of lodgepole pine (Craighead 1963), or in dense thickets of spruce and fir (Craighead and Craighead 1970). For this reason, feeding areas are close to dense stands of timber where grizzlies can retire during the daytime.

Home Range

The area of space, or home range, which contains the elements of grizzly habitat is variable. One grizzly in Yellowstone spent most of three years in an area five miles long and three miles wide. Another traveled over an area of about fourteen miles by four miles in a ten-day period (Craighead 1963). Grizzlies have a summer range varying from 12 square miles to 168 square miles in area, with an average of 29 square miles (Craighead and Craighead 1973).

Home ranges of grizzlies are of two types (Craighead and Craighead 1972): 1) a distinct, well-defined area used throughout the year, and 2) a summer and early fall foraging area, connected by a migratory corridor to an early spring or late fall area that contains the den.

Habitat Model

The above review of the habitat relationships of the grizzly bear provides an insight into its habitat preferences and requirements. A conceptual model of grizzly habitat has been developed to summarize these habitat elements (Figure 1). The model incorporates the habitat information presented in the published literature on the grizzly, and is a much-simplified model of a habitat that is probably more complex than the existing information indicates. This model should be tested and expanded or modified as additional information becomes available.

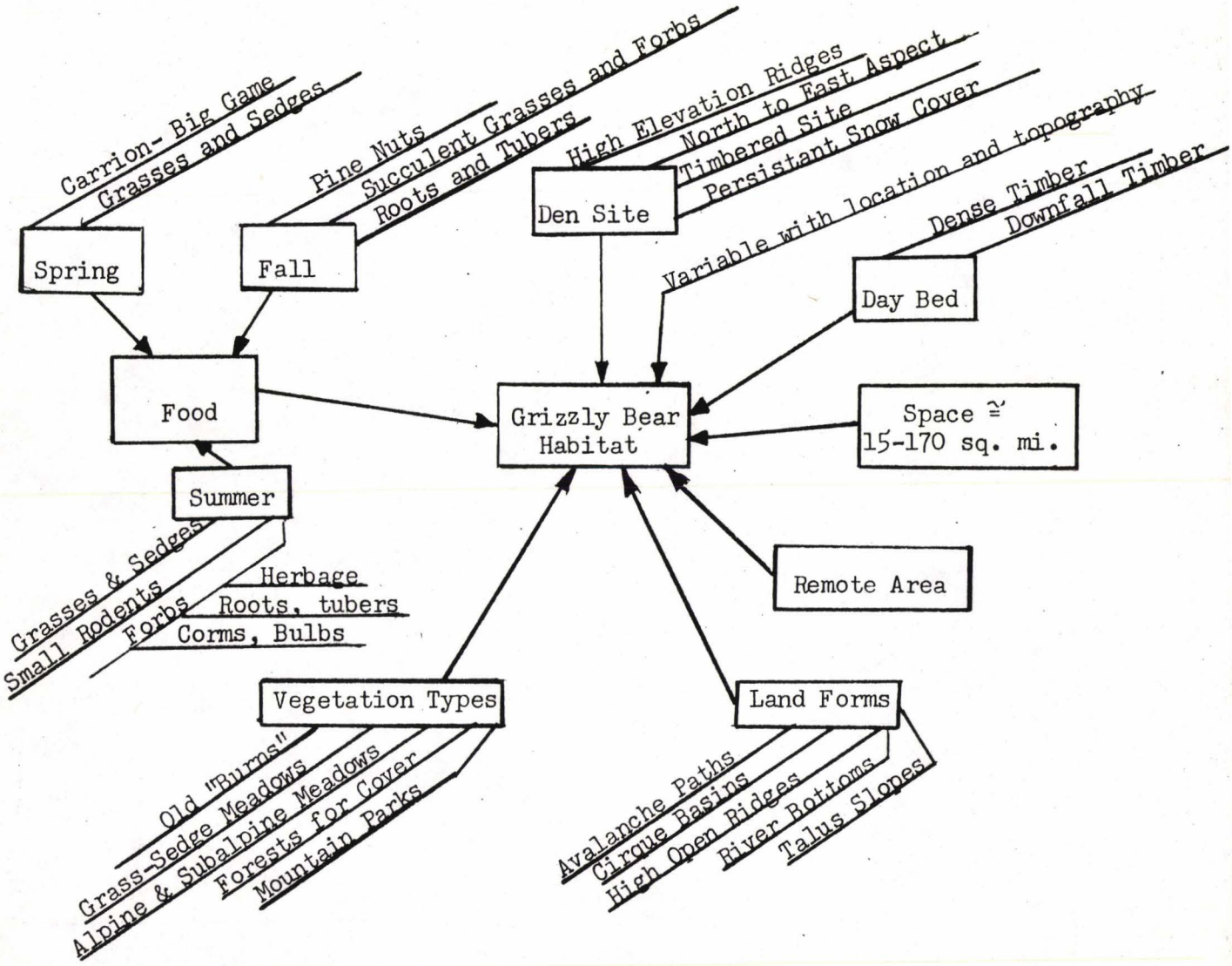

Figure 1. Conceptual Model of Grizzly Bear Habitat

Appendix 1. Habitat Types Used by Grizzly Bears Outside Classified Wilderness (from Schallenberger 1974).

Land Type Map Symbol	Habitat Types	Percent of Observations
10-10	Riparian- Picea/Libo	1
20-8a	Abla/Libo and Abla/Alsi	3
20-8d, 80-D9	Abla/Luhi and Abla-Pial/Vasc	4
21-9, 23-9f	Abla/Luhi Mefe phase	16
23-9b, 70C-9a	Abla-Pial/Vasc and Abla/Xete	38
22-8	Picea/Vaca and Psme/Caru	6
23-9	Psme/Caru and Psme/Syal	3
23-9d	Abla/Libo and Abla/Caru	3
23-9e	Abla/Xete and Abla/Clun	6
70C-9	Fesc/Agsp and Fesc	1
70C-9d	Abla-Pial/Vasc and Abla/Xete	3
70-D9	Fesc and Pofr/Fesc	4
82C-9	Rock or Scree	9
82C-1	Scree, Abla/Libo	3
		100

Appendix 2. Habitat Types Used by Grizzly Bears Inside Classified Wilderness (from Schallenberger 1974).

Land Type Map Symbol	Habitat Types	Percent of Observations
1	Abla/Vaca	4
3	Abla/Xete and Abla/Mefe	33
4	Picea/Vaca and Pofr/Fesc	6
7	Abla/Xete	2
8	Abla/Mefe and Abla/Alsi	2
9	Abla/Luhi and Abla (Pial)/Vasc	19
10	Fesc and Pofr/Fesc	4
11	Scree	24
12	Abla/Libo	2
13	Fesc and Abla/Libo	4
		100

Appendix 3. Locations of Grizzly Bears in Various Habitats in the Apgar Mountains, Glacier National Park, Montana (from Shaffer 1971).

Habitat, Descending in Elevation	1969	1970
High elevation, Subalpine fir/Whitebark pine	-	1
High elevation, Subalpine fir/ Menziesia, Beargrass, or Huckleberry	5	1
Middle Elevation, Douglas Fir-Spruce-Larch-Lodgepole Pine	5	1
Low Elevation, Spruce-Subalpine Fir-Lodgepole Pine	5	-
Low Elevation, Clover seeded roadside	-	-
Low Elevation, Cedar-Larch-Hemlock-Spruce	-	-
Low Elevation Wet Meadow	1	-
Low elevation, Spruce-Willow Creek Bottom	-	-

Appendix 4. Known Grizzly Bear Foods

Grasses and Grass-Like

Melica spectabilis- purple onion grass
Festuca ovina- sheep fescue
Calamagrostis canadensis- bluejoint reedgrass
Bromus carinatus- California bromegrass
Poa spp.- bluegrasses
Carex telmieri- sedge
Carex spp.- sedges
Lazula glabrata- wood rush
Lazula hitchcockii- wood rush

Shrubs (mostly fruits and berries)

Ribes lacustre- black currant
Amelanchier alnifolia- serviceberry
Crataegus douglasii- Douglas hawthorn
Lonicera involucrate- twinberry
Lonicera utahensis- red twinberry
Rhamnus alnifolia- alderleaf buckthorn
Shepherdia canadensis- buffaloberry
Sorbus scopulina- mountain ash
Rosa woodsii- woods rose
Cornus stolonifera- redosier dogwood
Arctostaphylos uva-ursi- kinnikinnick
Vaccinium membranaceum- huckleberry
Vaccinium scoparium- grouse whortleberry
Mahonia repens- Oregon grape
Aymphoricarpos albus- snowberry
Lonicera involucrate- twinberry honeysuckle
Vaccinium globulare- twinleaved huckleberry

Trees (mostly pine nuts)

Pinus albicaulis- whitebark pine
Pinus flexilis- limber pine

Forbs

Circium foliosum- elk thistle
Clatonia lanceolata- Spring beauty
Equisetum arvense- horsetail
Lomatium cous- mountain lomatium
Rubus parviflorus- thimbleberry
Erythronium grandiflorum- glacier lily

Castilleja spp.- Indian paintbrushes
Angelica dawsoni- shite angelica
Cornus canadensis- bunchberry dogwood
Heracleum lanatum- cow parsnip
Perideridia gairdneri- yampa
Smilacina racemosa- false solomon seal
Polygonium bistortoides- western bistort
Taraxacum officinale- dandelion
Trifolium repens- white Dutch clover
Smilacina stellata- star flowered solomon seal
Streptopus amplexifolius- twisted stalk
Valeriana sithensis- valerian
Clatonia megarrhiza- alpine spring beauty
Fragaria vesca- strawberry
Lomatium dissectum- lomatium
Camassia quamash- common camas
Frasera speciosa- frasera
Heracleum maximum- parsnip
Dodecatheon sp.- shooting star

Animals, Including Carrion

Cervus canadensis- elk
Odocoileus hemionus- mule deer
Odocoileus virginianus- white-tailed deer
Ovis canadensis- Rocky Mountain bighorn sheep
Citellus columbianus- Columbian ground squirrel
Ochotona princeps- pika
Thomomys talpoides- northern pocket gopher
Galliformes- grouse
Sciuridae- squirrels
Lepus spp.- rabbits and hares
Microtus spp.- field mice
Formicidae-
Fish

BIBLIOGRAPHY

1. Burke, Thomas E. Personal communication September 16, 1975. Wildlife Biologist. Colville N.F.
2. Burroughs, Raymond D. 1961. The natural history of the Lewis and Clark expedition. Michigan State University Press. pp.57-68.
3. Cahalane, Victor H. 1964. A preliminary study of distribution and numbers of cougar, grizzly and wolf in North Ameriaa. New York Zool. Soc. 12 pp.
4. Cole, Glen F. 1971a. Preservation and management of grizzly bears in Yellowstone National Park. BioScience 21(16):858-864.
5. Cole, Glan F. 1971b. Progress in restoring a natural grizzly bear population in Yellowstone National Park. Amer. Assoc. Adv. Sci. Smyposium on Research in National Parks. Dec. 21 pp.
6. Cole, Glen F. 1972. Grizzly bear-elk relationships in Yellowstone National Park. J. Wildl. Manage. 36(2):556-561.
7. Cole, Glan F. 1974. Management involving grizzly bears and humans in Yellowstone National Park, 1970-1973. BioScience 24(6):335-338.
8. Cook, Dwight. Personal communication July 25, 1975. Wildlife Specialist. Beaverhead N. F.
9. Cooney, Robert F. 1941. Grizzly bear study. Montana Fish and Game Dept. Progress Report. 23 pp.
10. Cooney, R. F. 1947. Grizzly bear notes. Proc. Ann. Conf. Western Assoc. State Game & Fish Commisioners. pp 122-126.
11. Cooney, Bob. 1953. Thars Bar in them thar hills. Montana Wildl. III(3):15-18.
12. Cooney, R. F. 1956. Wilderness monarch. Montana Wildlife VI: 14-17.
13. Craighead, Frank C., Jr. 1963. Progress in bio-telemetry studies of grizzly bears. Eighteenth Ann. Instrument Soc. of America's Conf. Bio-Telemetry Session. Mimeo. 11 pp.
14. Craighead, Frank C., Jr. 1968. Radiotracking of grizzly bears in Yellowstone National Park, Wyoming. Nat. Geogr. Soc. Res. Repts. 1963 Projects. pp 59-67.
15. Craighead, Frank C., Jr. and J. J. Craighead. 1960. Knocking out grizzly bears for their own good. National Geographic, August.

16. Craighead, Frank C., Jr. and J. J. Craighead. 1965. Tracking grizzly bears. BioScience 15(2):88-92.

17. Craighead, Frank C., Jr. and J. J. Craighead. 1968. Grizzly bear prehibernation and denning activities as determined by radio tracking. Unpubl. Report, Montana Coop. Wildlife Research Unit, Missoula. 49 pp.

18. Craighead, Frank C., Jr. and J. J. Craighead. 1969. Radiotracking of grizzly bears in Yellowstone National Park, Wyoming. Natl. Geogr. Soc. Res. Reports. 1964 Projects. pp 35-43.

19. Craighead, Frank C., Jr. and John J. Craighead. 1970. Data on grizzly bear denning activities and behavior obtained by using wildlife telemetry. in Bears- Their biology and management Herrero, Stephen, Editor. IUCN New Series No. 23. pp. 84-106.

20. Craighead, Frank C., Jr. and John J. Craighead. 1972. Grizzly bear prehibernation and denning activities as determined by radiotracking. Wildl. Mono. No. 32. 35 pp.

21. Craighead, Frank C., Jr. and John J. Craighead. 1973. Tuning in on the grizzly. Science Year Worldbook Science Annual. Field Enterprises Educational Corporation, Chicago. pp. 35-49.

22. Craighead, John. 1976. Studying grizzly habitat by satellite. Natl. Geographic 150(1):148-158.

23. Craighead, John J. and Frank C. Craighead, Jr. 1967. Management of bears in Yellowstone National Park. Mimeo. 113 pp.

24. Craighead, John J. and Frank C. Craighead, Jr. 1971. Grizzly bear-man relationships in Yellowstone National Park. BioScience 21(16):845-857.

25. Craighead, John J., Frank C. Craighead, Jr. and Maurice G. Hornocker. 1963. An ecological study of the grizzly bear. Fifth Annual Report. Mimeo. 14 pp.

26. Craighead, John J., Joel R. Varney, and Frank C. Craighead, Jr. 1974. A population analysis of the Yellowstone grizzly bears. Bull. No. 40, Montana Forest and Conservation Experiment Station. 20 pp.

27. Dean, F. C. 1958. Investigations on grizzly bear in interior and arctic Alaska. Alaska Coop. Wildl. Research Unit Quart. Rept. 9(4):61-71.

28. Erickson, A. W. 1975. Grizzly bear management in the Seeley Lake Ranger District, Lolo National Forest. U.S. Forest Service No. 26-3157.

29. Federal Register 40(145) Monday, July 28, 1975. Grizzly bear put on threatened list. pp. 31734- 31735.

30. Guilday, J. E. 1968. Grizzly bears from eastern North America. Amer. Midl. Nat. 79(1):247-250.

31. Hamlin, Kenneth L. and Mike Frisina. 1975. Special grizzly bear survey. Montana Fish and Game Dept. Progress Report. Project No. W-130-R-6, Jobs No. I-1 and I-4. 64 pp.

32. Herrero, S. 1970a. Human injury inflicted by grizzly bears. Science 170(3958):593-598.

33. Herrero, Stephen. 1970b. Man and the grizzly bear: present, past, but future? BioScience 20(21):1148-1153.

34. Hornocker, M. G. 1962. Population characteristics and social and reproductive behavior of the grizzly bear in Yellowstone National Park. Unpublished Thesis, Univ. of Montana, Missoula. 94 pp.

35. Johnson, Aubrey Stephen. 1974. Grizzly bear report released by National Academy of Sciences. Defenders of Wildlife Dec.:493-494.

36. Jenni, Donald R. Personal communication August 5, 1975. Wildlife Biologist. Clearwater N. F.

37. Jonkel, Charles J. 1975a. Opinion of bears and people. Western Wildlands 2(1):30-37.

38. Jonkel, Charles J. 1975b. Border grizzly habitat workshop proceedings. Mimeo.

39. Kennedy, Michael. 1960. The grizzly- fabled giant of western history. Montana Wildlife: 15-28.

40. Lauckhart, J. Burton and Earle F. Layser. 1975. Big game status report- grizzly bear section. Washington Game Dept. pp. 219-226.

41. Layser, Earle F. 1971. Notes on grizzly bear sightings in north-eastern Washington and adjacent northern Idaho. The Murrelet.

42. Layser, Earle F. Personal communication August 18, 1975. Resource analyst. Region 3 USFS. Albuquerque, N.M.

43. Lee, Lyndon C. and Robert D. Pfister. 1974. A training manual for Montana forest habitat types. School of Forestry, Univ. of Montana, Missoula. 116 pp.

44. Lloyd, K. A. 1975. Hunters, harvest and management of the grizzly bear in the Kootenay region. Unpublished Thesis, Univ. of British Columbia.

45. Ludlow, W. and G. Grinnell. 1876. Report of a reconnaissance from Carroll, Montana Territory, on the upper Missouri, to the Yellowstone National Park, and return, made in the summer of 1875. (Cited by Craighead and Craighead 1967 in Management of Bears in Yellowstone National Park).

46. Macpherson, A. H. 1965. The barren-ground grizzly bear and its survival in northern Canada. Canadian Audubon Magazine, Jan/Feb.

47. Marshell, P. B. 1955. Grizzly bear survey. Job completion report. Montana Fish and Game Dept. Wildlife Restoration Division. W-71-R, W-72-R, W-74-R. Job No. A7.

48. Martinka, C. J. 1971. Status and management of grizzly bears in Glacier National Park, Montana. Trans. 36th N. Am. Wildl. and Nat. Res. Conf. 312-322.

49. Martinka, C. J. 1972. Habitat relationships of grizzly bears in Glacier National Park, Montana. 19 pp.

50. Martinka, C. J. 1974a. Ecological role and management of U. arctos (carnivora) in Glacier National Park, Montana. Third Intl. Conf. on Bear Res. and Manage. Binghamton, New York.

51. Martinka, C. J. 1974b. Preserving the natural status of grizzlies in Glacier National Park. Wildl. Soc. Bull. 2(1):13-17.

52. Martinka, C. J. 1974c. Population characteristics of grizzly bears in Glacier National Park, Montana. J. Mammal. 55(1): 21-29.

53. Mealey, S. 1975. The natural food habits of free ranging grizzly bears in Yellowstone National Park. Unpublished Thesis, Montana State University, Bozeman. 158 pp.

54. Meehan, William R. 1961. Observations on feeding habits and behavior of grizzly bears. Am. Midl. Nat. 65(2):409-412.

55. Mohler, Levi L. 1973. Threatened wildlife of Idaho. Idaho Fish and Game report.

56. Montana Department of Fish and Game. 1975. Managing the grizzly. Montana Outdoors:35-37.

57. Mundy, K. R. D. 1963. Ecology of the grizzly bear (Ursus arctos L.) in Glacier National Park, British Columbia. Unpublished Thesis, University of Alberta, Edmonton. 103 pp.

58. Mundy, K. R. D. 1973. Grizzly. Canadian Wildl. Serv. Hinterland Who's Who.

59. Mundy, K. R. D. and D. R. Flook. 1973. Background for managing grizzly bears in the national parks of Canada. Canadian Wildl. Serv. Rep. Series Number 22.

60. Murie, Adolph. 1961. A naturalist in Alaska. Devin-Adair Co., New York. pp. 28-106.

61. Murie, Olaus J. 1957. The grizzly bear and the wilderness. Animal Kingdom, May-June:68-73.

62. Onishuk, Martin and D. S. Stockstad. 1957. Preliminary grizzly bear investigations. Montana Fish and Game Dept. Progress Report Project No. W-71-R-3, Job No. A-3. 11 pp.

63. Ormiston, John H. Personal communication August 8. 1975. Wildlife Biologist. Bitterroot N. F.

64. Roop, Larry. 1975. Grizzly bear progress report. Wyoming Game and Fish Dept. Report No. W-87-R-1. 60 pp.

65. Roscoe, Jim. Personal communication July 30, 1975. Wildlife Biologist. Red Rock Lakes N.W.R.

66. Ruediger, William. Personal communication July 22, 1975. Kootenai N. F.

67. Russell, Andy. 1967. Grizzly country. Alfred A. Knopf, New York. 302 pp.

68. Schallenberger, A. D. 1974. Reconnaissance survey of grizzly bear habitat, Rocky Mountain Division, Lewis and Clark National Forest. U. S. Forest Service. 46 pp.

69. Schoonmaker, W. J. 1968. The world of the grizzly bear. J. B. Lippincott Company, Philadelphia and New York. 190 pp.

70. Seton, Ernest Thompson. 1909. Lives of game animals. Vol. II. Doubleday, Doran and Company, Inc., New York. pp. 3-79.

71. Shaffer, Stephen C. 1971. Some ecological relationships of grizzly bears and black bears of the Apgar Mountains in Glacier National Park, Montana. Unpublished Thesis, Univ. of Montana, Missoula. 134 pp.

72. Skinner, M. P. 1925. Bears in the Yellowstone. A. C. McClurg and Co., Chicage. 155 pp.

73. Somerville, Ronald J. 1965. An evaluation of the 1961-1963 Alaskan brown and grizzly bear management program. Unpublished Thesis, Univ. of Montana, Missoula. 117 pp.

74. Soper, J. D. 1973. The mammals of Waterton Lakes National Park Alberta. Canadian Wildl. Serv., Report Series No. 23. 57 pp.

75. South, Phil. n. d. Grizzly bear habitat requirements and management implications. Mimeo. 2 pp.

76. Stover, T. I. and L. P. Tevis, Jr. 1955. California grizzly. Univ. of California Press, Berkeley. 355 pp.

77. Summer, J. and J. J. Craighead. 1973. Grizzly bear habitat in the Scapegoat Wilderness, Montana. Montata Coop. Res. Unit. Mimeo. 49 pp.

78. Taylor, Robert A., Jr. 1964. Columbia ground squirrel and cambium found in grizzly bear stomachs taken in the fall. J. Mammal. 45:476-477.

79. Turner, R. W. 1971. Mammals of the Black Hills of South Dakota and Wyoming. Unpublished Thesis, Univ. of Kansas. 361 pp.

80. U. S. Department of the Interior. 1918. Wild animals of Glacier National Park. 210 pp.

81. U. S. Fish and Wildlife Service. 1973. Threatened wildlife of the United States- grizzly bear. pp. 245-246.

82. U. S. Forest Service. 1975. Criteria for grizzly bear critical habitat identification. Mimeo. 16 pp.

83. Wasem, Robert. Personal communication August 12, 1975. Research Biologist. North Cascades N.P.

84. Washington Game and Fish Department. 1970. Rare mammals of Washington.

85. Weckwerth, R. 1971. Grizzly bear. In Game management in Montana. Montana Fish and Game Dept. Publ. pp. 121-124.

86. Wright, W. H. 1909. The grizzly bear: the narrative of a hunter-naturalist. Charles Scribner's Sons, New York. 268 pp.

Sources of Information by Subject

Historical Distribution: 2,20,23,30,36,39,45,46,50,69,70,79,86

Present Distribution: 1,3,4,7,8,24,26,29,34,35,36,37,40,41,46,47, 50,52,55,59,63,64,66,67,69,74,81,82,83,84,85

Habitat- General: 4,20,28,31,34,49,50,51,53,59,65,68,69,70,71,73, 74,75,77,82,85

Food Habits: 5,6,11,13,15,19,21,22,23,25,31,34,49,50,53,54,59,60, 61,65,68,69,71,73,75,77,78,80,86

Dens: 19,20,21,60,68,71,75

Day Beds: 13,16,19,20

Home Range: 13,16,20,21,48,77

General: 9,10,12,14,15,17,18,22,24,27,28,31,32,33,35,37,38,42,44, 51,52,54,56,57,58,60,61,62,69,70,72,76

LIBRARY COPY
ROCKY MTN. FOREST & RANGE
EXPERIMENT STATION